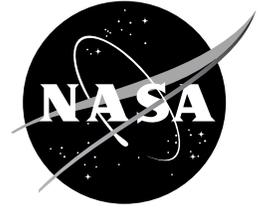


# Fact Sheet

National Aeronautics and  
Space Administration

Langley Research Center  
Hampton, Virginia 23681-2199



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## Micro-Vortex Generators Enhance Aircraft Performance

Small, trapezoid-shaped, fin-like devices placed on the flaps of aircraft wings are increasing performance, reducing noise and saving fuel. Called Micro-Vortex Generators, or Micro VGs, they are simple, inexpensive and relatively easy to install on new or existing aircraft.

### How Micro VGs Work

As air normally flows over the wing of an aircraft in flight, the air "sticks" to the surface of the wing. This adherence to the wing's surface produces lift. If the airflow loses its adherence and separates from the wing, aircraft performance can suffer in the form of increased drag, loss of lift and higher fuel consumption.

Researchers at NASA Langley Research Center developed Micro VGs to control this flow detachment by producing miniature, controlled tornadoes, called "vortices". The Micro VGs sweep away uncontrolled airflow separation over the airplane's wings and flaps with the benefit of reduced drag and increased lift (i.e., less engine power needed to produce the same lift).

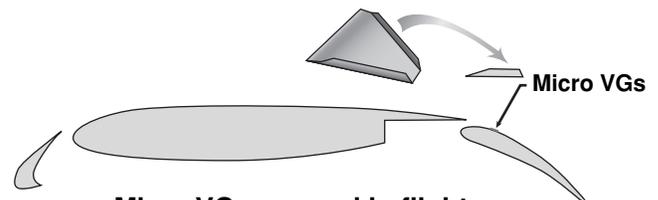
### Comprehensive Tests Net Practical Benefits

Working in partnership with McDonnell Douglas Aerospace (now Boeing, Long Beach), the new technology was tested on a number of wing designs in the NASA Langley Low-Turbulence Pressure Tunnel. The wind tunnel tests showed that Micro

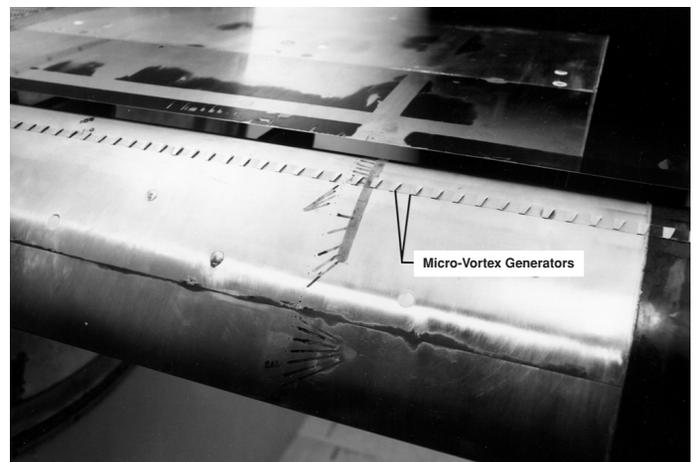
VGs dramatically enhanced performance on aircraft resulting in a 10% increase in lift, 50% decrease in drag, and a 100% increase in lift-to-drag ratio. These positive aerodynamic effects should also lead to improved landing performance and reduced approach noise.



Micro VGs retracted inside the flap well.



Micro VGs as used in flight.



Micro VGs shown installed on flap for wind tunnel tests.

# Contribution to General Aviation

In addition to contributions to the designs of commercial transport aircraft, the NASA Langley-developed Micro VGs are also being used by at least two General Aviation aircraft: the Gulfstream V and Piper Malibu Meridian.

The Gulfstream V was able to achieve a higher maximum cruise speed, extend its operational range and exhibit better controllability by using Micro VGs on its outboard wings. This enhanced flight capability of the aircraft allowed Gulfstream to meet their technical goals and assure a successful product.

During 1997, the Gulfstream V aircraft demonstrated its exceptional capabilities by setting 46 world and national records consisting of 21 speed records and 25 performance records. As a result, the Gulfstream V aircraft was named the winner of the 1997 Collier Trophy presented by the National Aeronautic Association (NAA).

This prestigious annual award recognizes the top aeronautical achievement in the United States. The Langley-developed Micro VG technology contributed greatly to the successful development of the aircraft.



**Wing area on a Gulfstream V where Micro VGs are installed.**

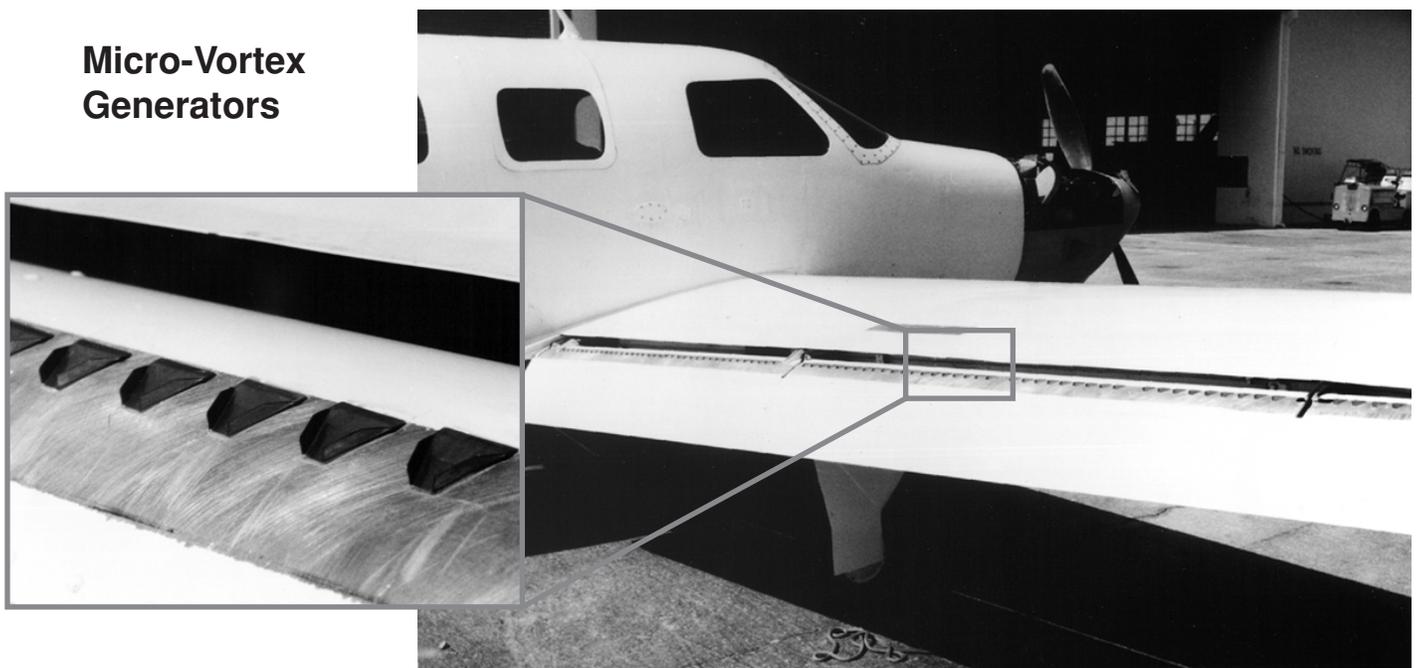
Through an agreement with NASA Langley, Micro VG technology was successfully transferred to the New Piper Aircraft, Inc. (Piper) in 1996. The flap-mounted Micro VGs enabled the Piper Malibu Meridian aircraft to easily pass the FAA safety certification requirement of a slow stall speed (below 61 kts.).

Micro VG technology contributed to performance and safety improvements as well as cost and noise reduction for the domestic aerospace industry. Its relatively simple design and ease of installation make Micro-Vortex Generators one of the most cost-effective means of aircraft safety and performance enhancement.

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*For more information, call the NASA Langley Office of Public Affairs at 757-864-6124.*

## Micro-Vortex Generators



**Enlarged area shows Micro VGs installed on the flap of a Piper Malibu Meridian.**